ABSTRACT

Methods, apparatuses and systems for producing powder particles of extremely small, highly uniform spherical shape and high sphericity, composed of metal including single metals and alloys, including nanocomposite structures, using a self-assembling procedure. The invention further includes the produced spherical particles. The metal spherical particles are produced whereby molten metal, alloys or composites are directed onto a fast-rotating disk in an atmosphere containing one or more inert gases and small amounts of an oxidizing gas and the molten metal drops are dispersed as tiny droplets for a predetermined time using centrifugal force within a cooling-reaction gas, and then cooled rapidly to form solid spherical particles. The spherical particles comprise a crystalline, amorphous or porous composition, having a size of 1-300 $\mu m \pm 1\%$ with a uniformity of size being $\leq$60-70% and a precise spherical shape of less than or equal to $\pm 10\%$.